

\*\*Table 1. Summary of hypotheses, corresponding specific predictions, and results.\*\* We count predictions as fully supported / rejected when the response matches/contradicts the prediction in both univariate and all top multivariate models (when applicable). Parentheses indicate that predictions were partially supported/ rejected–i.e., that the direction of response matched/contradicted the prediction but that the effect was not significant in all models.

Hypotheses & Specific Predictions	Prediction supported?				Results
	Overall	1966	1977	1999	
<b>H1.0. Larger-diameter trees have lower drought resistance (R).</b>					
1.0 - R decreases with stem diameter.	yes	yes	(yes)	(no)	Table 4
<b>H1.1. Tall trees have lower drought resistance.</b>					
1.1 - R decreases with height (H).	yes	yes	(yes)	(no)/(yes)	Tables 4, 5
<b>H1.2. Trees with more exposed crowns have lower drought resistance.</b>					
1.2a - Dominant trees have lowest R.	(yes)	yes	(yes)	(no)	Tables 4, 5
1.2b - Correcting for H, dominant trees have lowest R.	(no)	(no)	(yes)	no/(no)	Tables 4, 5
<b>H1.3. Small trees (lower root volume) suffer more in drier microhabitats.</b>					
1.3 - There is a negative interactive effect between height and TWI.	(no)	(no)	(no)	(no)	Table 4
<b>H2.1. Species traits predict drought resistance.</b>					
2.1a - Wood density correlates negatively to R.	(yes)	(yes)	(yes)	(no)	Table 4
2.1b - Leaf mass per area correlates positively to R.	(yes)	(yes)	(no)	(yes)	Table 4
2.1c - Ring-porous species have higher R than diffuse- or semi-ring- porous.	(yes)	yes/(yes)	(no)/no	yes	Tables 4, 5
2.1d - Percent loss leaf area upon desiccation (PLA) correlates negatively with R.	yes	yes	(yes)/yes	(yes)/(no)	Tables 4, 5
2.1e - Turgor loss point correlates negatively with R.	(yes)	(yes)/-	(yes)	(yes)/yes	Tables 4, 5
<b>H2.2. At the community level, taller trees have more drought-resistant traits.</b>					
2.2a - Community mean wood density correlates negatively to H.	yes	-	-	-	Table S5
2.2b - Community mean leaf mass per area correlates positively to H.	yes	-	-	-	Table S5
2.2c - Community fraction of diffuse porous species decreases with H.	no	-	-	-	Table S5
2.2d - Community mean PLA correlates negatively to H.	no	-	-	-	Fig. 2e, Table S5
2.2e - Community mean turgor loss point correlates negatively to H.	no	-	-	-	Fig. 2f, Table S5
<b>H2.3. When traits are accounted for, taller trees still have lower drought resistance.</b>					
2.3 - R decreases with H when traits are included in the statistical model.	yes	yes	(yes)	(yes)	Table 5
<b>H3.1. Resistance differs across the droughts considered here.</b>					
3.1 - Drought year explains variation in R.	no	-	-	-	Fig. 1b, Table 4
<b>H3.2. The direction of responses to predictor variables differs across droughts.</b>					
3.2 - Directions of responses to best predictor variables differ across droughts.	rarely	-	-	-	Tables 4,5
<b>H3.3. The strength of responses to predictor variables vary across droughts.</b>					
3.3 - Best predictor variables differ across droughts.	yes	-	-	-	Table 5

\*\*Table 2. Summary of variables\*\*

variable	symbol	units	description	category	n	observed values			ln-transformed?
						median	min	max	
<b>Dependent variable</b>									
drought resistance	R	-	ratio of growth during drought year to mean growth of the 5 years prior.	-	1596	0.87	0	1.99	no
<b>Independent variables</b>									
drought year	Y	-	year of drought	1966	478	-	-	-	-
				1977	547	-	-	-	-
				1999	571	-	-	-	-
<i>tree size</i>									
diameter breast height	DBH	cm	DBH in drought year	-	all	31.92	3.92	134.19	yes
height	H	m	H in drought year	-	all	20.21	4.76	43.87	yes
<i>microhabitat</i>									
crown position	CP	-	2018 crown position	dominant (D)	31	-	-	-	-
				co-dominant (C)	231	-	-	-	-
				intermediate (I)	224	-	-	-	-
				suppressed (S)	101	-	-	-	-
topographic wetness index	TWI	-	steady-state wetness index based on slope and upstream contributing area	-	all	5.66	0	16	yes
<i>species' traits</i>									
wood density	WD	g cm-3	dry mass of a unit volume of fresh wood	-	all	0.62	0.4	1.09	no
leaf mass per area	LMA	kg m-2	ratio of leaf dry mass to fresh leaf area	-	all	48.69	30.68	75.8	no
xylem porosity	XP	-	vessel arrangement in xylem	ring (R)	408	-	-	-	-
				semi-ring (SR)	31	-	-	-	-
				diffuse (D)	178	-	-	-	-
turgor loss point	TLP	MPa	water potential at which leaves wilt	-	all	-2.39	-2.76	-1.92	no
percent loss area	PLA	%	percent loss of leaf area upon dessication	-	all	13.06	8.52	24.64	no

**\*\*Table 3. Overview of analyzed species, their productivity in the plot, numbers and sizes sampled, and traits.\*\***  
Given are DBH mean and range of cored trees, the number of cores represented by each crown position of each species, and mean hydraulic trait measurements.

species	percent.ANPP	n.cores	mean.DBH_cm	DBH.range_cm	xylem.porosity	PLA_percent	LMA_g.per.cm2	TLP_Mpa	WD_g.per.cm3
Liriodendron tulipifera	47.1	109	36.9	90.4	diffuse	19.56	46.92	-1.92	0.40
Quercus alba	10.7	66	47.2	67.7	ring	8.52	75.80	-2.58	0.61
Quercus rubra	10.1	71	54.9	136.9	ring	11.01	71.13	-2.64	0.62
Quercus velutina	7.8	83	54.1	98.2	ring	13.42	48.69	-2.39	0.65
Quercus montana	4.8	67	42.2	76.7	ring	11.75	71.77	-2.36	0.61
Fraxinus americana	3.8	69	35.4	88.3	ring	13.06	43.28	-2.10	0.56
Carya glabra	3.7	39	31.4	88.7	ring	21.09	42.76	-2.13	0.62
Juglans nigra	2.1	31	48.1	62.8	semi-ring*	24.64	72.13	-2.76	1.09
Carya cordiformis	2.0	17	27.2	50.8	ring	17.22	45.86	-2.13	0.83
Carya tomentosa	2.0	18	21.0	20.1	ring	16.56	45.36	-2.20	0.83
Fagus grandifolia	1.5	81	23.5	96.0	diffuse	9.45	30.68	-2.57	0.62
Carya ovalis	1.1	24	35.3	51.1	ring	14.80	47.60	-2.48	0.96

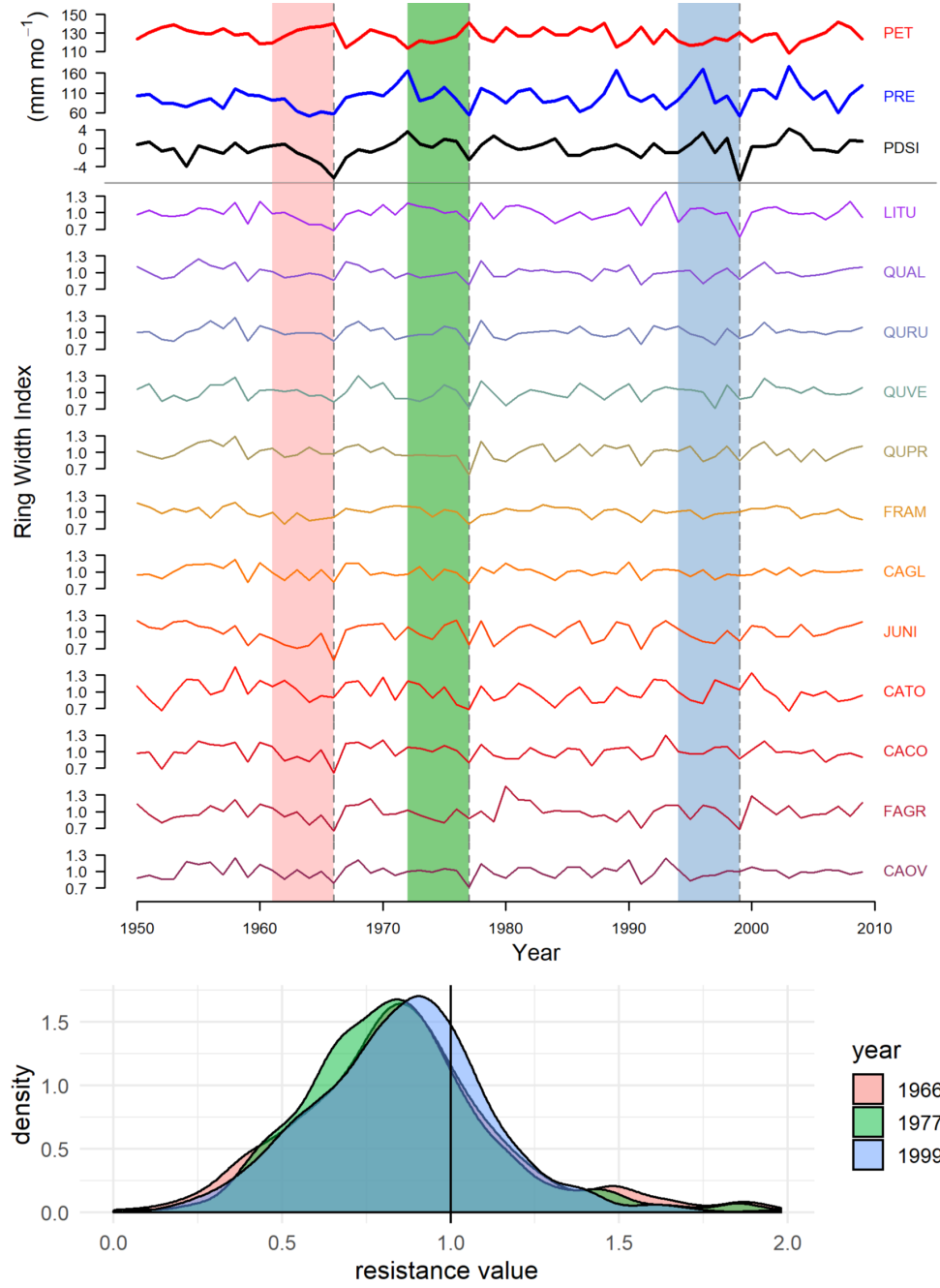
\*Semi-ring porosity is intermediate between ring and diffuse. We group it with diffuse-porous species for more even division of species between categories.

\*\*Table 4. Univariate models\*\*

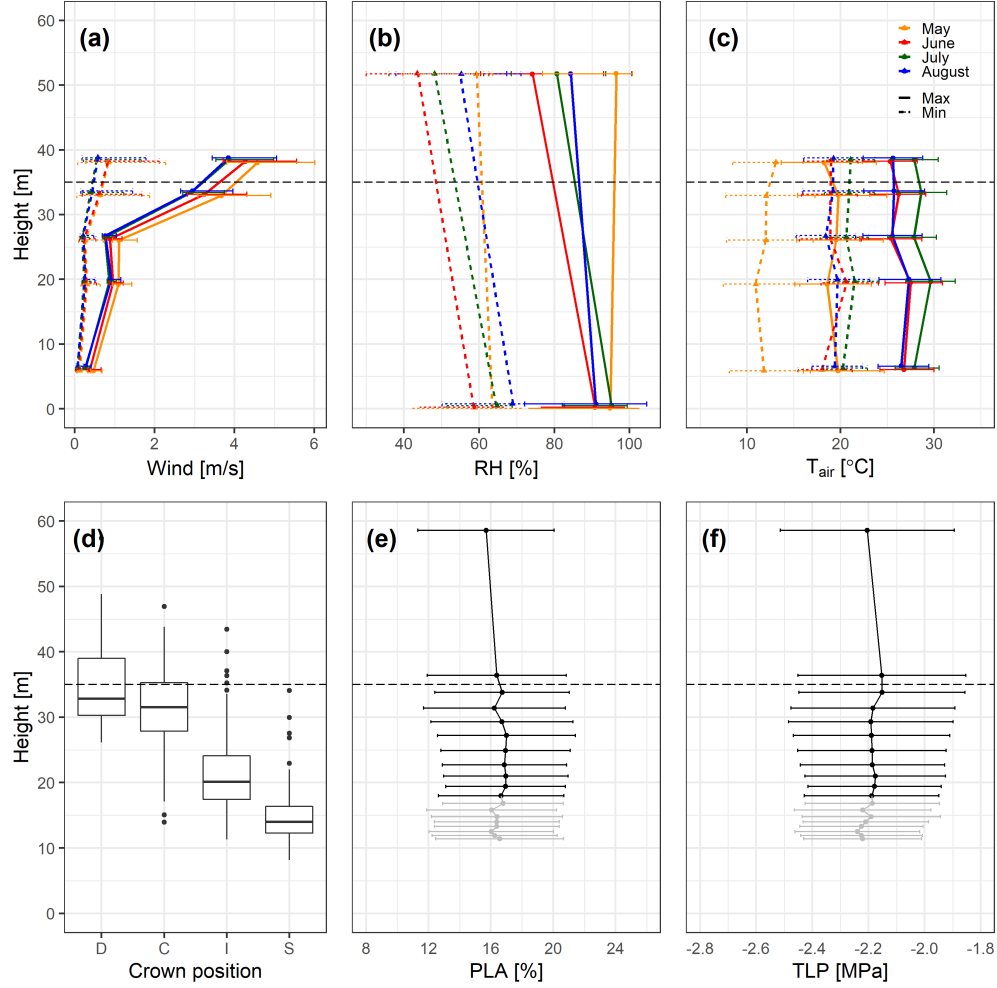
variable	category	null variables	all droughts		1966		1977		1999	
			dAICc	coefficients	dAICc	coefficients	dAICc	coefficients	dAICc	coefficients
drought year	1966		-2.42	0.0000	-	-	-	-	-	-
	1977		-	-0.0209	-	-	-	-	-	-
	1999		-	-0.0105	-	-	-	-	-	-
ln[DBH]		Y	8.17	-0.0385	15.32	-0.0888	-0.87	-0.0214	-1.93	0.0057
ln[height]		Y	8.17	-0.0620	15.32	-0.143	-0.87	-0.0345	-1.93	0.0092
crown position (alone)	D	Y	-2.96	-0.0461	3.25	-0.0509	0.66	-0.0759	0.38	-0.0103
	C		-	0.0000	-	0	-	0	-	0
	I		-	-0.0063	-	0.0732	-	-0.0298	-	-0.0563
	S		-	0.0122	-	0.0526	-	0.0432	-	-0.0483
crown position (with height)	D	ln[H]+Y	0.57	-0.0347	-1.84	-0.0328	-0.23	-0.073	3.04	-0.0024
	C		-	0.0000	-	0	-	0	-	0
	I		-	-0.0425	-	0.0139	-	-0.0388	-	-0.081
	S		-	-0.0582	-	-0.0662	-	0.0258	-	-0.0956
ln[TWI]		ln[H]+Y	5.34	-0.0890	-1.96	-0.0171	5.05	-0.1404	2.8	-0.1033
ln[TWI]*ln[H]		ln[H]+ln[TWI]+Y	-0.83	0.0824	-1.58	0.0958	-1.47	0.089	-1.9	0.0428
wood density		ln[H]+Y	-1.91	-0.0479	-1.24	-0.2089	-1.22	-0.1812	0.22	0.2502
leaf mass per area		ln[H]+Y	-1.99	0.0003	-1.88	0.0012	-1.76	-0.0013	-2	0.0004
xylem porosity	R	ln[H]+Y	-0.71	0.0660	2.305	0.1888	1.399	-0.1452	3.765	0.1544
	D/SR		-	0.0000	-	0	-	0	-	0
turgor loss point		ln[H]+Y	1.33	-0.1777	-1.64	-0.1078	1.26	-0.25	0.016	-0.1732
percent loss area		ln[H]+Y	7.17	-0.0140	9.18	-0.0249	-0.05	-0.0105	-0.716	-0.0074

**\*\*Table 5. Summary of  $R^2$  and coefficients of the best multivariate models for each drought instance.\*\*** Models are ranked by AICc, and we show all models whose AICc value falls within 2.0 (dAICc<2) of the best model (bold).

drought	dAICc	R2	Intercept	ln[H]	crown position				ln[TWI]	xylem architecture			PLA	TLP
					D	C	I	S		diffuse	ring			
<b>all</b>	<b>0.000</b>	<b>0.12</b>	<b>1.085</b>	<b>-0.059</b>	-	-	-	-	<b>-0.086</b>	-	-		<b>-0.012</b>	<b>-0.113</b>
	0.586	0.11	1.373	-0.057	-	-	-	-	-0.086	-	-		-0.013	-
	0.726	0.12	1.232	-0.092	-0.034	0	-0.037	-0.051	-0.079	-	-		-0.012	-0.101
	0.813	0.11	1.493	-0.092	-0.034	0	-0.039	-0.054	-0.079	-	-		-0.014	-
	1.289	0.13	1.020	-0.06	-	-	-	-	-0.085	0	0.032		-0.011	-0.125
	1.818	0.13	1.160	-0.094	-0.034	0	-0.038	-0.052	-0.078	0	0.036		-0.011	-0.114
<b>1966</b>	<b>0.000</b>	<b>0.25</b>	<b>1.523</b>	<b>-0.146</b>	-	-	-	-	-	<b>0</b>	<b>0.11</b>		<b>-0.021</b>	<b>-</b>
	1.115	0.25	1.641	-0.14	-	-	-	-	-	-	-		-0.025	-
	1.837	0.26	1.594	-0.17	-0.04	0	0.011	-0.067	-	0	0.113		-0.021	-
<b>1977</b>	<b>0.000</b>	<b>0.21</b>	<b>1.136</b>	<b>-</b>	-	-	-	-	<b>-0.145</b>	<b>0</b>	<b>-0.205</b>		<b>-0.015</b>	<b>-0.13</b>
	0.040	0.21	1.490	-	-	-	-	-	-0.145	0	-0.22		-0.017	-
	0.505	0.22	1.089	-	-0.069	0	-0.025	0.043	-0.137	0	-0.199		-0.014	-0.143
	0.818	0.22	1.481	-	-0.07	0	-0.027	0.038	-0.136	0	-0.216		-0.017	-
	1.301	0.21	1.172	-0.025	-	-	-	-	-0.142	0	-0.198		-0.014	-0.139
	1.641	0.21	1.540	-0.021	-	-	-	-	-0.142	0	-0.215		-0.017	-
<b>1999</b>	<b>0.000</b>	<b>0.23</b>	<b>0.464</b>	<b>-</b>	-	-	-	-	<b>-0.095</b>	<b>0</b>	<b>0.16</b>		<b>-</b>	<b>-0.197</b>
	0.019	0.24	0.735	-0.07	0	0	-0.077	-0.09	-0.084	0	0.167		-	-0.183
	1.034	0.23	0.600	-0.078	-0.003	0	-0.081	-0.095	-	0	0.171		-	-0.186
	1.130	0.25	0.528	-	-0.007	0	-0.051	-0.041	-0.093	0	0.158		-	-0.181
	1.945	0.22	0.284	-	-	-	-	-	-	0	0.163		-	-0.2
	1.955	0.24	0.414	-	-	-	-	-	-0.097	0	0.166	0.002	-0.207	



**Figure 1. Climate and species-level growth responses over our study period, highlighting the three focal droughts (a) and community-wide responses** Time series plot (a) shows peak growing season (May–August) climate conditions and residual chronologies for each species. Focal droughts are indicated by dashed lines, and shading indicates the pre-drought period used in calculations of the resistance metric. Figure modified from Helcoski *et al.* (2019). Density plots (b) show the distribution of resistance values for each drought.



**Figure 2. Height profiles in growing season climatic conditions, tree heights by crown position, and leaf hydraulic traits** The top row shows averages ( $\pm$  SD) of daily maxima and minima of (a) wind speed, (b) relative humidity ( $RH$ ), and (c) air temperature ( $T_{air}$ ) averaged over each month of the peak growing season (May-August) from 2016-2018. In these plots, heights are slightly offset for visualization purposes. Also shown are (d) 2018 tree heights by canopy position (see Table 2 for codes) and vertical profiles in (e)  $PLA_{dry}$  and (f)  $\pi_{tlp}$ . In (e-f), values are community-wide averages across height bins (plotted at upper end of height bin), with grey indicating bins for which species-level trait measurements are available for  $<75\%$  of individuals. In all plots, the dashed horizontal line indicates the 95th percentile of tree heights in the ForestGEO plot.